

Catalogue of American Amphibians and Reptiles.

McCranie, J. R. 2017. *Atelophryniscus*,
Atelophryniscus chrysophorus.

***Atelophryniscus* McCranie, Wilson, and
Williams
Quebrada de Oro Toads**

Atelophryniscus McCranie, Wilson, and Williams 1989:2. Type species: *Atelophryniscus chrysophorus* McCranie, Wilson, and Williams (1989), by original designation and by monotypy.

Aelurophryniscus: Inger 1992:237. *Lapsus*.

Atelophryniscus: Altig and Channing 1993:73. *Lapsus*.

Bufo: Pramuk and Lehr 2005:613.

Chaunus: Frost et al. 2006:364. By implication.

Rhinella: Chaparro, Pramuk, and Gluesenkamp 2007:211. By implication.

CONTENT. One species, *Atelophryniscus chrysophorus*, is recognized (see **Comments**).

DESCRIPTION. *Atelophryniscus* is a small bufonid (in ten adult males, snout-vent length [SVL] range = 35.4–40.1 mm, mean [standard deviation] = 37.8 mm [\pm 1.6 mm]; in seven adult females, SVL range = 49.4–59.6 mm, mean [standard deviation] = 53.7 mm [3.2 mm]). The head is relatively short and broad (head length/SVL in adult males = 0.297–0.334, in adult females = 0.290–0.304; head width/SVL in males = 0.319–0.359, in adult females = 0.303–0.327). The snout is nearly rounded in dorsal aspect and rounded in lateral profile. The top of the head is flat, but slightly concave between the nostrils. The canthal ridges are angular and the loreal regions are slightly concave. The nostrils are directed laterally and are situated at a point slightly over one-half the distance between the anterior borders of the prominent eyes



FIGURE 1. Adult male (USNM 523121; SVL 35.5 mm) of *Atelophryniscus chrysophorus* from Quebrada de Oro, Atlántida, Honduras. Photographed by the author on 17 May 1988.

(interorbital distance/eye length in males = 0.848–1.000, in females = 0.914–1.036) and the tip of snout. The skin of the head is co-ossified with the underlying skull. The supra-orbital crests are low and confluent with the short and low parietal crests. The postorbital crests are pustulose and low to indistinct. The supratympanic crests are low and in contact with the parotoid glands. Canthal and preorbital crests are absent to indistinct. The pre-tympanic crests are pustulose and low to indistinct. The parotid crests are subtriangular and slightly larger than, to about equal to, the size of the prominent upper eyelids (upper eyelid width/interorbital distance in males = 0.739–0.929, in females = 0.672–0.868), and extend posteriorly to a level varying from between the axillae to the anterior insertions of forelimbs. Parotoid glands are usually distinct, occasionally indistinct, especially in females. Tympana are absent to indistinct (usually indistinct or absent in males, usually indistinct in females). The pupils are horizontally elliptical and the palpebral membranes are translucent, with scattered silver flecks.

The upper arms are more slender than the moderately robust forearms. There is no transverse dermal fold on the upper surfac-



MAP. Distribution of *Atelophryniscus* and its only known species *Atelophryniscus chrysophorus*. Dot marks type locality and the open circle contacting the dot marks other nearby locality records. The second known area of occurrence is marked by the remaining open circle.

es of the wrists, nor dermal ridges along the posterior ventrolateral edges of the forearms, although numerous tubercles are present along each forearm. The fingertips are narrowly expanded and there is no digital groove around the tips of the fingers. The subarticular tubercles on the fingers are round to ovoid, and globular to nearly conical. Supernumerary tubercles are absent to indistinct. The palmar tubercles are elevated and round to ovoid, and much larger than the thenar tubercles. Numerous small accessory palmar tubercles are present. The thenar tubercles are round and barely elevated, not visible from above, and bear a patch of tiny nuptial excrescences in adult males. Each prepollex is not enlarged, but an extensive thumb pad bearing tiny nuptial excrescences is present in adult males. The first fingers are shorter than the second fingers; relative length of all fingers = $I < II < IV < III$. The fingers are not webbed, but bear weak lateral keels.

The hind limbs are relatively long (shank length/SVL in males = 0.461–0.510, in females = 0.419–0.464; foot length/SVL in males = 0.427–0.496, in females = 0.428–0.464). The heels narrowly overlap when the hind limbs are held together towards the cloacal opening at right angles to the body. The vertical dermal fold on the outer lateral edge of each heel is weak to absent. Numerous tubercles are present along the posterior edge of each tarsus. A tuberculate inner tarsal fold extends about three-quarters the length of each tarsus. The subarticular tubercles on the toes are round to ovoid and globular. Supernumerary tubercles are absent to indistinct. The plantar tubercles are small and indistinct. The inner metatarsal tubercles are elongate, elevated, and visible from above. The outer metatarsal tubercles are small, round to ovoid, and elevated. Relative toe length is $I < II < V = III < IV$. The toe tips are not expanded and lack digital grooves. The webbing formula of the feet is



FIGURE 2. Amplexant pair of *Atelophryniscus chrysophorus* (male USNM 523141, SVL 37.9 mm; female USNM 523142, SVL 59.6 mm) from Quebrada de Oro, Atlántida, Honduras. These and other adults collected 12–14 February 1995 were the last adults of this genus and species seen alive by a biologist. Photographed by the author on 12 February 1995.

I $\frac{1}{3}$ – $1\frac{1}{2}$ II $\frac{1}{3}$ –2 III $\frac{3}{4}$ –3⁺ IV 3–1⁺ V. Lateral fleshy fringes are present on the unwebbed portions of the toes.

The vent opening is directed posteroventrally near upper level of thighs with skin around the vent strongly granular to tuberculate. The skin of the dorsal surface of the body has numerous, scattered, small to moderately-sized tubercles. The skin of the upper eyelids has small to moderately-sized tubercles and that of the dorsal surfaces of the limbs has numerous small to moderately-sized tubercles. A dorsolateral row of weakly to moderately enlarged tubercles is usually present. The skin of the chin, throat, and chest is granular to strongly granular and those of the belly and ventral surfaces of thighs are granular to weakly granular. The tongue is elongately ovoid, not notched posteriorly, and is attached for about 20% of its length (anteriorly). Vomerine and maxillary teeth are absent and choanae are ovoid to elliptical. Males have paired vocal slits and a single, median, vocal sac, but

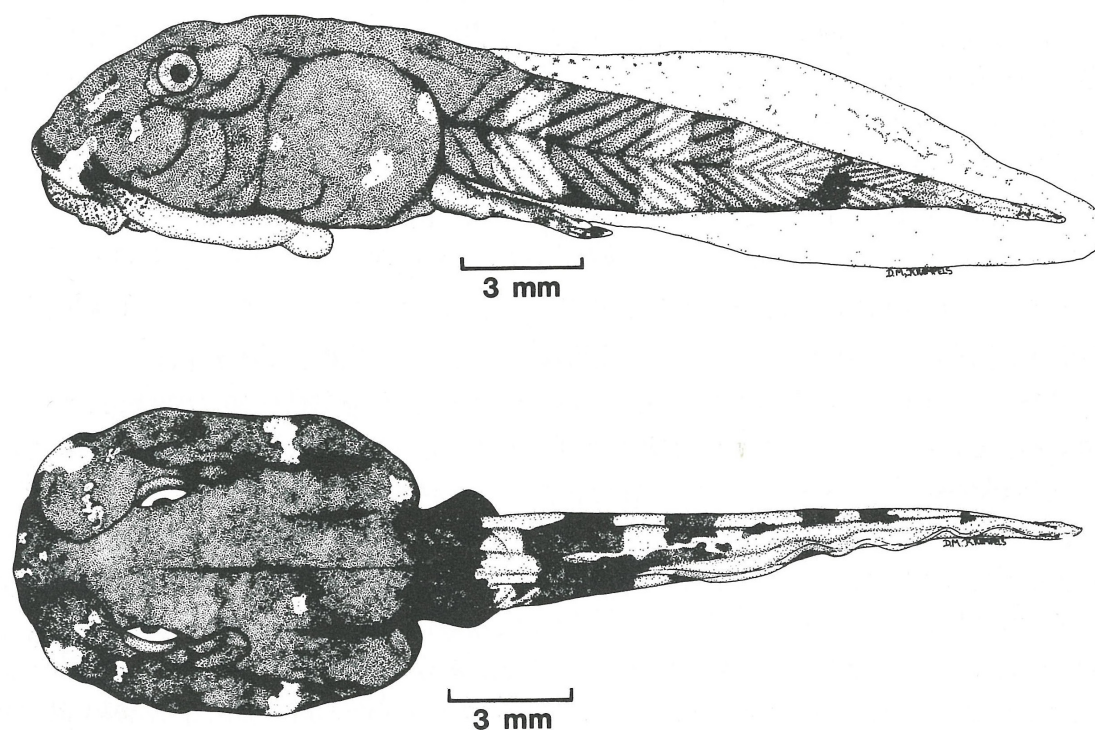


FIGURE 3. Drawings of lateral (top) and dorsal (bottom) views of tadpole of *Atelophryniscus chrysophorus* (in lot KU 206748) in Gosner stage 35 (Gosner 1960).

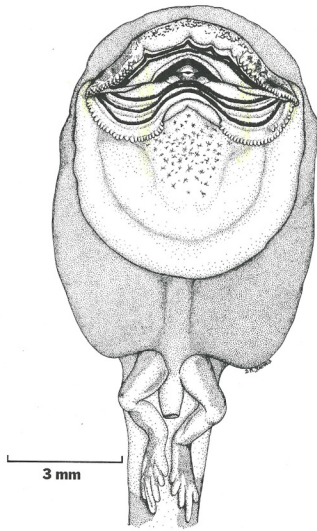


FIGURE 4. Oral disc and ventral view of tadpole of *Atelophryniscus chrysophorus* (in lot KU 206748) in Gosner stage 35 (Gosner 1960).

that sac is not evident externally.

Color in life of the male holotype (KU 206730) follows. The dorsal surfaces of the head and body were pale lime green with olive brown blotching and rusty-red-tipped pustules. Pale orange pustules outlined the lower edge of a pale lime-green lateral stripe. That lateral stripe was bordered below by a dark brown line grading to olive brown ventrally. The side of head was pale yellow, mottled with dark brown in front of and below the eye. A rusty-red, dark brown-bordered bar extended from each eye to the posterior edges of the lips, that bar also with olive brown blotches. Each iris was pale metallic green. The limbs were a pale lime-green dorsally and the toe tips and outer edges of the webs were orange. The ventral surface of the body was pale blue-green, mottled with dark chocolate brown. Color notes of other adults and subadults were published by McCranie and Wilson (2002).

A typical tadpole (KU lot 206748) in Gosner stage 37 (Gosner 1960) had the following measurements (all measurements in mm, ratios based on those measurements). The body length was 9.6, the tail length was 16.8,



FIGURE 5. Lateral view of living tadpole of *Atelophryniscus chrysophorus* (in lot KU 206750) in about Gosner stage 40–41 (Gosner 1960). Photographed by the author at 790 m elevation on 16 August 1984.



FIGURE 6. Dorsal view of living tadpole of *Atelophryniscus chrysophorus* (in lot KU 206750). Gosner stage (Gosner 1960) unknown. Photographed by the author at 790 m elevation on 16 August 1984.

and the total length was 26.4. The body is depressed and 1.5 times wider than high. The snout is broadly semicircular in dorsal aspect and broadly rounded in lateral profile. The eyes are small (eye length / body length about 0.09), and directed anterolaterally. The interorbital distance is about 1.2. The nostrils are situated considerably closer to the eyes than the tip of snout, and directed anterolaterally. The spiracle is sinistral, directed posterodorsally, and situated low on the body at a point about three-fourths distance from the tip of snout to posterior end of body. The vent tube is medial. The tail musculature is robust, extending nearly to the tip of the rounded tail. The dorsal fin is slightly arched, highest at about midlength of tail, and terminating posterior to body. The ventral fin is not no-

ticeably arched. The height of the tail musculature is greater than the height of either the dorsal or ventral fins at midlength of the tail. The oral disc is huge (oral disc width / snout width about 1.04) and ventral. Large dorsal and ventral gaps are present in the marginal papillae, with two rows of marginal papillae present lateral to the dorsal gap (about 10–12 papillae present per mm). The remainder of the lateral portion of the oral disc is bordered by a single row of submarginal papillae. The oral disc is emarginated laterally. The keratinized jaw sheaths are narrow and lack serrations. The upper jaw sheath is widely arched, with short, lateral processes. The lower jaw sheath is widely V-shaped. The labial tooth rows are 2 / 3, all complete, long, subequal, and extending to the lateral portion of the oral disc. The gastromyzophorous suctorial disc has a raised rim laterally and posteriorly, with the rim extending about three-fourths the length of body.

The color in life of tadpoles in KU lot 206748 follow. The dorsal and lateral surfaces of the body were black with gold flecking and/or spotting. The tail musculature was black with pale yellow bands or spots. The tail fins were clear with the dorsal fin lightly flecked with black (all of the above data were taken by the author and were published by McCranie et al. 1989, McCranie and Castañeda 2007, and McCranie and Wilson 2002; also see McCranie et al. 1989 for color notes on older tadpoles and metamorphosing individuals).

DIAGNOSIS. The combination of having parotoid glands and cranial crests and the absence of maxillary and vomerine teeth distinguishes *Atelophryniscus*, and its single species, *Atelophryniscus chrysophorus*, from all other anurans in Honduras, except for the remaining bufonid genera (*Incilius*, *Rhinella*, and *Rhaebo*). *Atelophryniscus* differs from those genera in Honduras in having the first finger shorter than the second finger, and in lacking a tympanum, or having an indistinct tympanum. Also, the lotic water-dwelling

gastromyzophorous tadpole of *Atelophryniscus* is drastically different from the lentic water larvae of the remaining Honduran bufonid genera in having a raised rim laterally and posteriorly, with the rim extending about three-fourths the length of the body.

PUBLISHED DESCRIPTIONS, ILLUSTRATIONS, DISTRIBUTION, FOSSIL RECORD, AND PERTINENT LITERATURE. See species account.

REMARKS. Adults of the monotypic genus *Atelophryniscus* were last seen in the vicinity of its type locality during February 1995 and tadpoles and a recent metamorph (SVL 12 mm) were last seen there during June 1996. The author made unsuccessful subsequent searches in the vicinity of the type locality during February 2003 and June 2005. Neither adults nor tadpoles could be found at its second known locality in the Texíguat region at the same stream as the type locality of *Isthmohyla insolita* (McCranie, Wilson, and Williams 1993; only at a slightly lower elevation of 1450 m [versus 1550 m]) of the western portion of the Cordillera Nombre de Dios on three and four day trips during August 1991, August 1993, July 1995, February 2003, July 2004, and April 2010. Thus, the genus and its only known species are thought to be extinct. McCranie and Castañeda (2005, 2007) also reached that same grim conclusion (also see **Comments** for the species *Atelophryniscus chrysophorus*).

ETYMOLOGY. *Atelophryniscus* is formed from the Greek prefix *a-* (without), the Greek words *telo* (complete), and *phryne* (toad), and the Greek diminutive suffix *-iskos*. The name alludes to the resemblance of the tadpole of this genus with those of the bufonid genus *Atelopus* and the resemblance of the adult to various species placed in the bufonid toad genus *Bufo* at the time of its description, and to the relatively small size of its adult. The gender is masculine.

COMMENTS. Pramuk and Lehr (2005:613) thought *Atelophryniscus* was closely enough related to *Bufo* (= *Rhinella*) *veraguensis* that they placed *Atelophryniscus* in the synonymy of *Bufo* (= *Rhinella*). It would defy all biogeographic knowledge gained over the years about amphibians and reptiles of Honduras to think that a small endemic toad from an isolated, montane endemic hotspot in Honduras would be most closely related to a group of toads otherwise confined “along the Andes from Peru to northwestern Argentina” (Haad et al. 2014:184), thousands of miles to the south. Similar views were expressed by Köhler (2011) and McCranie and Castañeda (2007). McCranie et al. (1989) discussed the relationships of *Atelophryniscus* with other bufonid genera recognized at that time and Señaris et al. (1994) briefly touched on those same relationships. Because of publication dates, Frost et al. (2006) did not evaluate the taxonomic decisions made by Pramuk and Lehr (2005) and listed *Atelophryniscus* among the bufonid genera they considered valid; by implication, the taxonomy proposed by Frost et al. (2006) synonymized *Atelophryniscus* with *Chaunus*. Frost (2017) synonymized the genus with *Rhinella* following Chaparro et al. (2007).

***Atelophryniscus chrysophorus* McCranie,
Wilson, and Williams
Quebrada de Oro Toad**

Atelophryniscus chrysophorus McCranie, Wilson, and Williams 1989:3. Type locality, “Quebrada de Oro (15°38'N, 86°47'W), elevation 880 m, tributary of Río Viejo, south slope of Cerro Búfalo, Cordillera de Nombre de Dios, Depto. Atlántida, Honduras.” Holotype, University of Kansas, Museum of Natural History, Lawrence (KU) 206730, an adult male, collected 16 August 1982 by J. R. McCranie, K. L. Williams, and L. D. Wilson (examined by author).

Aelurophryniscus chrysophorus: Inger 1992:

237. *Lapsus*.

Atelophryniscus chrysophorus: Altig and Channing 1993:73. *Lapsus*.

Atelophryniscus chrysophorous: Coloma and Lötters 1996:69. *Lapsus*.

Bufo chrysophorus: Pramuk and Lehr 2005: 615.

Chaunus chrysophorus: Frost 2007: published online. By implication

Rhinella chrysophora: Chaparro, Pramuk, and Gluesenkamp 2007:211. By implication.

Rhinella chrysophora: Wilson and Johnson 2010:110. First use of combination in print.

CONTENT. No subspecies are recognized.

DESCRIPTION AND DIAGNOSIS. See generic account.

PUBLISHED DESCRIPTIONS. Detailed descriptions of the external morphology of the adult and/or tadpole, based on data gathered by the author, were published by McCranie et al. (1989), McCranie and Castañeda (2007), and McCranie and Wilson (2002). The chondrocranium and visceral skeleton of the tadpole were described by Lavilla and de Sá (2001). The pale bands on the tail of the tadpole was described by Altig and Channing (1993). Brief descriptions of some osteological and myological characters of an adult were provided by McCranie et al. (1989; also see Duellman and Schulte 1992), and detailed descriptions of some osteological characters were published by Pramuk and Lehr (2005). Basic conditions of inguinal fat bodies and sternal morphology of *Atelophryniscus chrysophorus* were provided by da Silva and Mendelson (1999).

ILLUSTRATIONS. **Color photographs** of an adult were published by Köhler (2011). McCranie and Wilson (2002), McCranie and Castañeda (2007), Stuart et al. (2008), and Wilson and McCranie (2004a). **Black-and-white photographs** of the adult were presented by McCranie et al. (1989) and Pramuk and

Lehr (2005); a black-and-white photograph of a juvenile and a tadpole were published by Pramuk and Lehr (2005). **Black-and-white illustrations** of the tadpole were published by McCranie et al. (1989), McCranie and Castañeda (2007), McCranie and Wilson (2002), and Wilson and McCranie (1993). Black-and-white illustrations of the adult skull and vertebral column were presented by Pramuk and Lehr (2005) and the chondrocranium and hyobranchial skeletons of the tadpole were published by Lavilla and de Sá (2001).

DISTRIBUTION. *Atelophryniscus chrysophorus* is known to occur from 750 to 1760 m elevation in the Premontane Wet Forest and Lower Montane Wet Forest formations (see Holdridge 1967) in the central and western portions of the Cordillera Nombre de Dios, Honduras (but see **Remarks** for genus).

FOSSIL RECORD. None.

PERTINENT LITERATURE. Relevant citations are listed by topic: **checklists and faunal lists** (Anonymous 2016; Campbell 1999; Duellman 1993, 2001; Glaw et al. 1998, 2000a, 2000b; Hero et al. 2012; Hutchins et al. 2003; McCranie 2006, 2007, 2009, 2015; McCranie and Castañeda 2005, 2007; McCranie and Solís 2013; McCranie and Wilson 2002; McCranie et al. 2006; Solís et al. 2014; Townsend and Wilson 2010, 2016; Wilson and Johnson 2010; Wilson and McCranie 1994, 2004b; Wilson and Townsend 2006, 2010; Wilson et al. 2001; Young et al. 2004a, 2004b), **comparisons to new species** (Graybeal and Canatella 1995; Lehr et al. 2005), **conservation status** (Johnson et al. 2015; McCranie and Wilson 2004; Stuart et al. 2008; Townsend et al. 2012; Wilson and McCranie 1998, 2004a, 2004b; Wilson and Townsend 2006, 2010;), **tadpole keys** (McCranie and Castañeda 2007; McCranie and Wilson 2002; Wilson and McCranie 1993), **tadpole morphology/gastromyzophorous larvae** (Aguayo et al. 2009; Altig

and McDiarmid 1999a, 1999b; Haad et al. 2014; Hoff et al. 1999; Kaplan 1997; Lehr et al. 2005; Lötters 1996; McCranie and Wilson 2000; McDiarmid and Altig 1999; Pereyra et al. 2015; Wells 2007), **taxonomy, systematics, and phylogenetics** (Altig and McDiarmid 1999b; Chaparro et al. 2007; Frost 2007, 2017; Frost et al. 2006; McCranie and Castañeda 2007; McCranie and Wilson 2002; Pramuk and Lehr 2005).

REMARKS. McCranie et al. (1989) discussed that the tadpole of *Atelophryniscus chrysophorus* had an amazing resemblance to that of another bufonid genus, *Atelopus*, and suggested that resemblance was a result of convergent adaptations to life in fast-flowing streams. Subsequently, Coloma and Lötters (1996:69) wrote that the term convergent adaptation “is unwarranted in the absence of a detailed analysis of bufonid relationships.”

Solís et al. (2014:124) wrote “Townsend and Wilson (2010) listed this species [*A. chrysophorus*] as *Rhinella chrysophora*, based on the opinion of Chaparro et al. (2007).” Chaparro et al. (2007) did not specifically mention *Atelophryniscus chrysophorus* (nor *Rhinella chrysophora*), but instead only implied *Rhinella* included *Atelophryniscus chrysophorus* by using “*R. veraguensis* group.” Pramuk and Lehr (2005) concluded *Atelophryniscus chrysophorus* was closely related to the *Rhinella veraguensis* group. Also, Wilson and Johnson (2010) previously used the new combination *Rhinella chrysophora*.

This species was included in the 2012 list of endemic fauna of the Reserva de Vida Silvestre Texíguat (Townsend et al. 2012), but not in the 2010 list (Townsend et al. 2010).

ADDITIONAL VERNACULAR NAMES.

The names Rio Viejo Toad and Rio Viejo Toads were published by Frank and Ramus (1995), although this toad does not occur along that river, but instead along an upper tributary of that river. Stream Toads and Río Viejo Toad were listed for the genus and spe-

cies, respectively, by Wrobel (2004).

ETYMOLOGY. The name *chrysophorus* is derived from the Greek noun *chrysus* (gold) and the Greek suffix *-phora* (bearing). The reference is to the gold markings on the otherwise black tadpole, to the name of the stream at the type locality (Quebrada de Oro), and the fact that the gold-spotted tadpole used to occur abundantly in that stream. One can easily believe the name of the stream, Quebrada de Oro, was founded because of the numerous and obvious distinctly gold-spotted tadpoles of *Atelophryniscus chrysophorus* that were so obvious during the first few years of my work in that area before the population crashed (also see McCranie and Castañeda 2005:10).

COMMENTS. The last specimens of *Atelophryniscus chrysophorus* were seen alive during 1996, before the author began collecting tissues. Thus, no tissues are available from this taxon for molecular analyses. The single phylogenetic analysis performed for this species used only morphological data (Pramuk and Lehr 2005), and resulted in a questionable taxonomic decision.

Habitat destruction occurring at the type locality of *Atelophryniscus chrysophorus* along the Quebrada de Oro, Atlántida was discussed by McCranie and Castañeda (2005, 2007), McCranie and Wilson (2002), and Wilson and McCranie (1998). Destruction of the forest by humans played a significant role in facilitating landslides that destroyed the portions of the Quebrada de Oro in which both adults and larva of *Atelophryniscus chrysophorus* lived. Further complicating that habitat destruction was the documentation of the chytrid fungus *Batrachochytrium dendrobatidis* in two of the four anuran species collected along the Quebrada de Oro in 2003 (Puschendorf et al. 2006). This chytrid fungus has been linked to anuran declines in other neotropical regions (Puschendorf et al. 2006).

During October 1998, the torrential rains from Hurricane Mitch, aided by previous

habitat destruction, caused much larger landslides, some of which devastated parts of the Quebrada de Oro and the small stream at the second known locality of *Atelophryniscus chrysophorus* in the Texíguat region, Yoro. As a result of all of those stream-altering landslides, much of the Quebrada de Oro and the small stream at the second known locality of *Atelophryniscus* are no longer fit for this species. The slight hope for remaining populations of *Atelophryniscus* would most likely be on the remaining forested north slopes of the Cordillera Nombre de Dios that have not been damaged by landslides. Unfortunately, the majority of those slopes are so steep that few permanent streams exist above about 900 m elevation.

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LITERATURE CITED

- Aguayo, R., E. O. Lavilla, M. F. Vera Candiotti, and T. Camacho. 2009. Living in fast-flowing water: Morphology of the gastromyzophorous tadpole of the bufonid *Rhinella quechua* (*R. veraguensis* group). *Journal of Morphology* 270:1431–1442.
- Altig, R. and A. Channing. 1993. Hypothesis: Functional significance of colour and pattern of anuran tadpoles. *The Herpetological Journal* 3:73–75.
- Altig, R. and R. W. McDiarmid. 1999a. Body plan. Development and morphology. Pp. 24–51 in *Tadpoles. The Biology of Anuran Larvae* (R. W. McDiarmid and R. Altig, editors). The University of Chicago Press, Chicago, Illinois.
- Altig, R. and R. W. McDiarmid. 1999b. Diversity. Familial and generic characterizations. Pp. 295–337 in *Tadpoles. The Biology of Anuran Larvae* (R. W. McDiarmid and R. Altig, editors). The University of

- Chicago Press, Chicago, Illinois.
- Anonymous. 2016. Herpetofaunal list for Mesoamerica. Mesoamerican Herpetology (www.mesoamericanherpetology.com/taxonomic-list.html); last assessed 5 May 2017).
- Campbell, J. A. 1999. Distribution patterns of amphibians in Middle America. Pp. 111–210 in *Patterns of Distribution of Amphibians. A Global Perspective* (W. E. Duellman, editor). The John Hopkins University Press, Baltimore, Maryland.
- Chaparro, J. C., J. B. Pramuk, and A. G. Gluesenkamp. 2007. A new species of arboreal *Rhinella* (Anura: Bufonidae) from cloud forest of southeastern Peru. *Herpetologica* 63:203–212.
- Coloma, L. A. and S. Lötters. 1996. The tadpole of *Atelopus balios* (Anura: Bufonidae) from the Pacific lowlands of Ecuador. *Herpetologica* 52:66–70.
- da Silva, H. R. and J. R. Mendelson, III. 1999. A new organ and sternal morphology in toads (Anura: Bufonidae): Descriptions, taxonomic distribution, and evolution. *Herpetologica* 55:114–126.
- Duellman, W. E. 1993. Amphibian species of the world: Additions and corrections. The University of Kansas Museum of Natural History, Special Publication 21:i–iii, 1–372.
- Duellman, W. E. 2001. The Hylid Frogs of Middle America. Volume 2. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology 18:v–x, 695–1158, plates 1–92.
- Duellman, W. E. and R. Schulte. 1992. Description of a new species of *Bufo* from northern Peru with comments on phenetic groups of South American toads (Anura: Bufonidae). *Copeia* 1992:162–172.
- Frank, N. and E. Ramus. 1995. A Complete Guide to Scientific and Common Names of Reptiles and Amphibians of the World. N G Publishing Inc., Pottsville, Pennsylvania. 377 pp.
- Frost, D. R. 2007. Amphibian Species of the World: An Online Reference. Version 5.0. American Museum of Natural History, New York, New York. [Cited in Frost 2017. Not seen; no on-line archive of database is available].
- Frost, D. R. 2017. *Rhinella chrysophora* (McCrane, Wilson, and Williams, 1989) | Amphibian Species of the World: An Online Reference. Version 6.0. American Museum of Natural History, New York, New York. Available at <http://research.amnh.org/vz/herpetology/amphibia/Amphibia/Anura/Bufonidae/Rhinella/Rhinella-chrysophora>. Archived by WebCite at <http://www.webcitation.org/6qIQ-vAt4g> on 7 May 2017.
- Frost, D. R., T. Grant, J. Faivovich, R. H. Bain, A. Hass, C. F. B. Haddad, R. O. de Sá, A. Channing, M. Wilkinson, S. G. Donnellan, C. J. Raxworthy, J. A. Campbell, B. L. Blotto, P. Moler, R. C. Drewes, R. A. Nussbaum, J. D. Lynch, D. M. Green, and W. C. Wheeler. 2006. The amphibian tree of life. *Bulletin of the American Museum of Natural History* 297:1–370, + foldout phylogenetic tree.
- Glaw, F., J. Köhler, R. Hofrichter, and A. Dubois. 1998. Systematik der Amphibien: Liste der rezenten Familien, Gattungen und Arten. Pp. 252–258 in *Amphibien. Evolution, Anatomie, Physiologie, Ökologie und Verbreitung, Verhalten, Bedrohung und Gefährdung* (R. Hofrichter, editor). Naturbuch Verlag, Augsburg, Germany.
- Glaw, F., J. Köhler, R. Hofrichter, and A. Dubois. 2000a. Amphibian Systematics: List of recent families, genera, and species. Pp. 252–258 in *Amphibians: The World of Frogs, Toads, Salamanders, and Newts*. (R. Hofrichter, editor). Firefly Books (U.S.), Inc., Buffalo, New York.
- Glaw, F., J. Köhler, R. Hofrichter, and A. Dubois. 2000b. Amphibian Systematics: List of recent families, genera, and species. Pp. 252–258 in *The Encyclopedia of Amphibians* (R. Hofrichter, editor). Key Porter

- Books Limited, Toronto, Ontario, Canada.
- Gosner, K. L. 1960. A simplified table for staging anuran embryos and larvae with notes on identification. *Herpetologica* 16:183–190.
- Graybeal A. and D. C. Cannatella. 1995. A new taxon of Bufonidae from Peru, with descriptions of two new species and a review of the phylogenetic status of supraspecific bufonid taxa. *Herpetologica* 51:105–131.
- Haad, M. B., F. Vera Candioti, and D. Baldo. 2014. The stream tadpoles of *Rhinella rumbolli* (Anura: Bufonidae). *Herpetologica* 70:184–197.
- Hero, J.-M., C. Morrison, J. Chanson, S. Stuart, and N. A. Cox. 2012. Phylogenetic correlates of population decline and extinction risk in amphibians. Pp. 3539–3551 in *Amphibian Biology*. Volume 10. Conservation and Decline of Amphibians: Ecological Aspects, Effect of Humans, and Management (H. Heatwole and J. W. Wilkinson, editors). Surrey Beatty & Sons Pty Limited, Baulkham Hills, New South Wales, Australia.
- Hoff, K. vS., A. R. Blaustein, R. W. McDiarmid, and R. Altig. 1999. Behavior. Interactions and their consequences. Pp. 215–239 in *Tadpoles. The Biology of Anuran Larvae* (R. W. McDiarmid and R. Altig, editors). The University of Chicago Press, Chicago, Illinois.
- Holdridge, L. R. 1967. *Life Zone Ecology*. Revised Edition. Tropical Science Center, San José, Costa Rica. 206 pp.
- Hutchins, M., W. E. Duellman, and N. Schlager (editors). 2003. *Grizmek's Animal Life Encyclopedia*. Second Edition. Volume 6. Amphibians. The Gale Group, Inc., Farmington Hills, Michigan. xvi + 507 pp.
- Inger, R. F. 1992. Variation of apomorphic characters in stream-dwelling tadpoles of the bufonid genus *Ansonia* (Amphibia: Anura). *Zoological Journal of the Linnean Society* 105:225–237.
- Johnson, J. D., V. Mata-Silva, and L. D. Wilson. 2015. A conservation reassessment of the Central American herpetofauna based on the EVS measure. *Amphibian & Reptile Conservation* 9(2)[General Section]:1–94(e100).
- Kaplan, M. 1997. Internal and external anatomy of the abdominal disc of *Atelopus* (Bufonidae) larvae. *Caldasia* 19:61–69.
- Köhler, G. 2011. *Amphibians of Central America*. Herpeton, Verlag Elke Köhler, Offenbach, Germany. 378 pp.
- Lavilla, E. O. and R. de Sá. 2001. Chondocranium and visceral skeleton of *Atelopus tricolor* and *Atelophryniscus chrysophorus* tadpoles (Anura, Bufonidae). *Amphibia-Reptilia* 22:167–177.
- Lehr, E., J. B. Pramuk, and M. Lundberg. 2005. A new species of *Bufo* (Anura: Bufonidae) from Andean Peru. *Herpetologica* 61:308–318.
- Lötters, S. 1996. *The Neotropical Toad Genus Atelopus. Checklist — Biology — Distribution*. M. Vences & F. Glaw Verlags GbR, Köln, Germany. 143 pp., 70 plates.
- McCranie, J. R. 2006. Specimen Locality Data & Museum Numbers / Ubicación y Números de Museo de los Especímenes, Información Complementaria for/a la “Guía de Campo de los Anfíbios de Honduras” by/por James R. McCranie and Franklin E. Castañeda. *Smithsonian Herpetological Information Service* 137:1–39.
- McCranie, J. R. 2007. Distribution of the amphibians of Honduras by departments. *Herpetological Review* 38:35–39.
- McCranie, J. R. 2009. Amphibians and reptiles of Honduras. *Listas Zoológicas Actualizadas UCR*. Museo de Zoología UCR, San Pedro, Costa Rica. 20 pp. <http://museo.biologia.ucr.ac.cr/Listas/Anteriores/HerpHon.htm> (last accessed 1 May 2017).
- McCranie, J. R. 2015. A checklist of the amphibians and reptiles of Honduras, with additions, comments on taxonomy, some recent taxonomic decisions, and

- areas of further studies needed. *Zootaxa* 3931:352–386.
- McCranie, J. R. and F. E. Castañeda. 2005. The herpetofauna of Parque Nacional Pico Bonito, Honduras. *Phyllomedusa* 4:3–16.
- McCranie, J. R. and F. E. Castañeda. 2007. *Guía de Campo de los Anfibios de Honduras*. Bibliomania!, Salt Lake City, Utah. x + 304pp. + 147 plates.
- McCranie, J. R. and J. M. Solís. 2013. Additions to the amphibians and reptiles of Parque Nacional Pico Bonito, Honduras, with an updated nomenclatural list. *Herpetology Notes* 6:239–243.
- McCranie, J. R. and L. D. Wilson. 2000. A new species of high-crested toad of the *Bufo valliceps* group from north-central Honduras. *Journal of Herpetology* 34:21–31.
- McCranie, J. R. and L. D. Wilson. 2002. The Amphibians of Honduras. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology 19. i–x + 625 pp., 1–20 plates.
- McCranie, J. R. and L. D. Wilson. 2004. The Honduran amphibian fauna: Perched on the brink of decline, Pp. 71–75 in *Collected DAPTF Working Group Reports: Ten Years On* (J. W. Wilkinson, editor). DAPTF, Milton Keynes, United Kingdom. [Apparently mailed in 2006].
- McCranie, J. R., L. D. Wilson, and K. L. Williams. 1989. A new genus and species of toad (Anura: Bufonidae) with an extraordinary stream-adapted tadpole from northern Honduras. *Occasional Papers of the Museum of Natural History, The University of Kansas* 129:1–18.
- McCranie, J. R., L. D. Wilson, and K. L. Williams. 1993. New species of tree frog of the genus *Hyla* (Anura: Hylidae) from northern Honduras. *Copeia* 1993:1057–1062.
- McCranie, J. R., J. H. Townsend, and L. D. Wilson. 2006. *The Amphibians and Reptiles of the Honduran Mosquitia*. Krieger Publishing Company, Malabar, Florida. i–x + 291 pp.
- McDiarmid, R. W. and R. Altig. 1999. Research. Materials and techniques. Pp. 7–23 in *Tadpoles. The Biology of Anuran Larvae* (R. W. McDiarmid and R. Altig, editors). The University of Chicago Press, Chicago, Illinois.
- Pereyra, M. O., M. F. Vera Candioti, J. Faivovich, and D. Baldo. 2015. Egg clutch structure of *Rhinella rumbolli* (Anura: Bufonidae), a toad from the Yungas of Argentina, with a review of the reproductive diversity in *Rhinella*. *Salamandra* 51:161–170.
- Pramuk, J. B. and E. Lehr. 2005. Taxonomic status of *Atelophryniscus chrysophorus* McCranie, Wilson, and Williams, 1989 (Anura: Bufonidae) inferred from phylogeny. *Journal of Herpetology* 39:610–618.
- Puschendorf, R., F. Castañeda, and J. R. McCranie. 2006. Chytridiomycosis in wild frogs from Pico Bonito National Park, Honduras. *EcoHealth* 3:178–181.
- Señaris, J. C., J. Ayarzagüena, and S. Gorzula. 1994. Los sapos de la familia Bufonidae (Amphibia: Anura) de las tierras altas de la Guayana Venezolana: Descripción de un nuevo género y tres especies. *Publicaciones de la Asociación de Amigos de Doñana* 3:1–37.
- Solís, J. M., L. D. Wilson, and J. H. Townsend. 2014. An updated list of the amphibians and reptiles of Honduras, with comments on their nomenclature. *Mesoamerican Herpetology* 1:122–144.
- Stuart, S. N., M. Hoffmann, J. S. Chanson, N. A. Cox, R. J. Berridge, P. Ramani, and B. E. Young (editors). 2008. *Threatened Amphibians of the World*. Lynx Edicions, Barcelona, Spain. xv + 758 pp.
- Townsend, J. H. and L. D. Wilson. 2010. Conservation of the Honduran herpetofauna: Issues and imperatives. Pp. 460–487 in *Conservation of Mesoamerican Amphibians and Reptiles* (L. D. Wilson, J. H. Townsend, and J. D. Johnson, editors). Eagle Mountain Publishing, LC., Eagle Mountain, Utah.
- Townsend, J. H. and L. D. Wilson. 2016. Am-

- phibians of the Cordillera Nombre de Dios, Honduras: COI barcoding suggests underestimated taxonomic richness in a threatened endemic fauna. *Mesoamerican Herpetology* 3:909–928.
- Townsend, J. H., J. M. Butler, L. D. Wilson, and J. D. Austin. 2010. A distinctive new species of moss salamander (Caudata: Plethodontidae: *Nototriton*) from an imperiled Honduran endemism hotspot. *Zootaxa* 2434:1–16.
- Townsend, J. H., L. D. Wilson, M. Medina-Flores, E. Aguilar-Urbina, B. K. Atkinson, C. A. Cerrato-Mendoza, A. Contreras-Castro, L. N. Gray, L. A. Herrera-B., I. R. Luque-Montes, M. McKewy-Mejía, A. Portillo-Avilez, A. L. Stubbs, and J. D. Austin. 2012. A premontane hotspot for herpetological endemism on the windward side of Refugio de Vida Silvestre Texíguat, Honduras. *Salamandra* 48:92–114.
- Wells, K. D. 2007. *The Ecology and Behavior of Amphibians*. The University of Chicago Press, Chicago, Illinois. xi + 1148 pp.
- Wilson, L.D. and J. Johnson. 2010. Distributional patterns of the herpetofauna of Mesoamerica, a biodiversity hotspot. Pp. 30–235 *in* Conservation of Mesoamerican Amphibians and Reptiles (L. D. Wilson, J. H. Townsend, and J. D. Johnson, editors). Eagle Mountain Publishing, LC., Eagle Mountain, Utah.
- Wilson, L. D. and J. R. McCranie. 1993. Preliminary key to the known tadpoles of anurans from Honduras. Royal Ontario Museum, Life Sciences Occasional Paper 40:1–12.
- Wilson, L. D. and J. R. McCranie. 1994. Second update on the list of amphibians and reptiles known from Honduras. *Herpetological Review* 25:146–150.
- Wilson, L. D. and J. R. McCranie. 1998. Amphibian population decline in a Honduran National Park. *Froglog* 25:1–2.
- Wilson, L. D. and J. R. McCranie. 2004a. The conservation status of the herpetofauna of Honduras. *Amphibian and Reptile Conservation* 3:6–33. [Published online in 2003].
- Wilson, L. D. and J. R. McCranie. 2004b. The herpetofauna of the cloud forests of Honduras. *Amphibian and Reptile Conservation* 3:34–48. [Published online in 2003].
- Wilson, L. D. and J. H. Townsend. 2006. The herpetofauna of the rainforests of Honduras. *Caribbean Journal of Science* 42:88–113.
- Wilson, L. D. and J. H. Townsend. 2010. The herpetofauna of Mesoamerica: Biodiversity significance, conservational status, and future challenges. Pp. 760–812 *in* Conservation of Mesoamerican Amphibians and Reptiles (L. D. Wilson, J. H. Townsend, and J. D. Johnson, editors). Eagle Mountain Publishing, LC., Eagle Mountain, Utah.
- Wilson, L. D., J. R. McCranie, and M. R. Espinal. 2001. The ecogeography of the Honduran herpetofauna and the design of biotic reserves. Pp. 109–158 *in* Mesoamerican Herpetology: Systematics, Zoogeography, and Conservation (J. D. Johnson, R. G. Webb, and O. Flores-Villega, editors). Centennial Museum, The University of Texas at El Paso, Special Publication 1.
- Wrobel, M. (compiler). 2004. *Elsevier's Dictionary of Amphibians in Latin, English, German, French and Italian*. Elsevier B. V., Amsterdam, The Netherlands. ix + 396 pp.
- Young, B. E., S. N. Stuart, J. S. Chanson, N. A. Cox, and T. M. Boucher. 2004a. *Disappearing Jewels. The Status of New World Amphibians*. NatureServe, Arlington, Virginia. 54 pp.
- Young, B. E., S. N. Stuart, J. S. Chanson, N. A. Cox, and T. M. Boucher. 2004b. *Joyas que Están Desapareciendo. El Estado de los Anfíbios en el Nuevo Mundo*. NatureServe, Arlington, Virginia. 54 pp.

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